merlinb

Awesome!

Posts: 2,215

Merlin, Lancashire UK

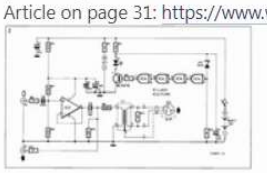
Location: Lancashire

Simple Buffer / transformer isolator from 1991

Today at 10:17:40 AM

Last Edit: ***Today*** *at 10:40:14 AM by merlinb*

I was browsing old Elektor eiditons and saw this, and thought I'd post it here for interest. A simple transformer isolator / Di box. Before you ask, all those logic gates are just to make the LED flash, to conserve battery power.
Article on page 31: https://www.worldradiohistory.com/Archive-Elektor-USA/Elektor-Electronics-USA-1991-09.pdf



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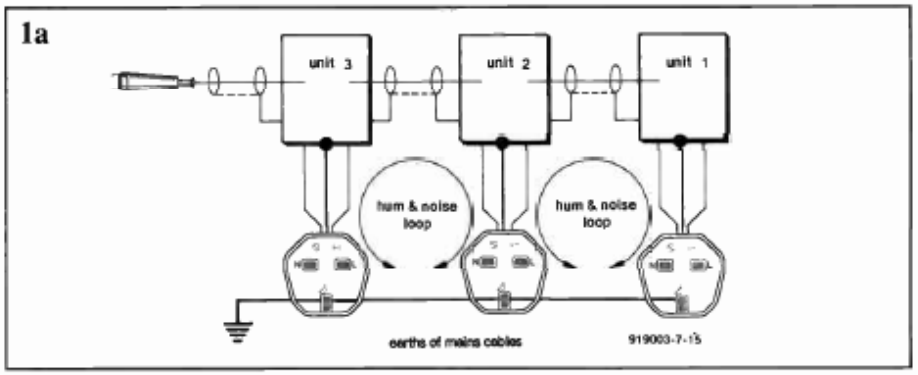
ASYMMETRICAL-TO-SYMMETRICAL CONVERTER

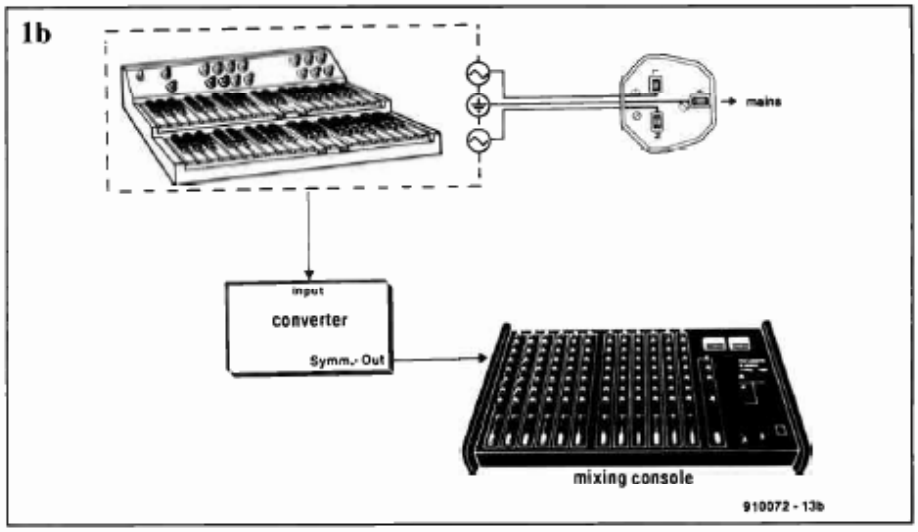
by M. Eller

IT OFTEN happens in electrophonics (electronic music) that hum-and-noise loops occur when two or more different instruments are intercoupled as in Fig. 1a. Some musicians play with their lives by covering the earth pins with insulating tape to get rid of the hum. This is, of course, not only very stupid, but also highly dangerous.

A safe and certain method of getting rid of these loops is offered by the converter whose circuit is shown in Fig. 2. The converter is connected between two instruments as shown in Fig. 1b to provide electrical separation of the instruments. Make sure that the 'isolated' instruments are not drawn into new hum-and-noise loops through a common enclosure: each and every instrument must be isolated from the enclosure.

The converter resolves another problem also. On cost grounds, many commercial instruments have only a relatively high impedance output. Even pick-ups often suffer from this. When long connecting leads are used, or the signal is divided, or a following instrument has a low impedance input, noise and hum are the result and the quality of the music suffers. The converter has a high impedance input, and two low impedance outputs (one not isolated).





Circuit description

The input signal arrives at K_1 and from there it is applied via C_5 to IC_2, which is arranged

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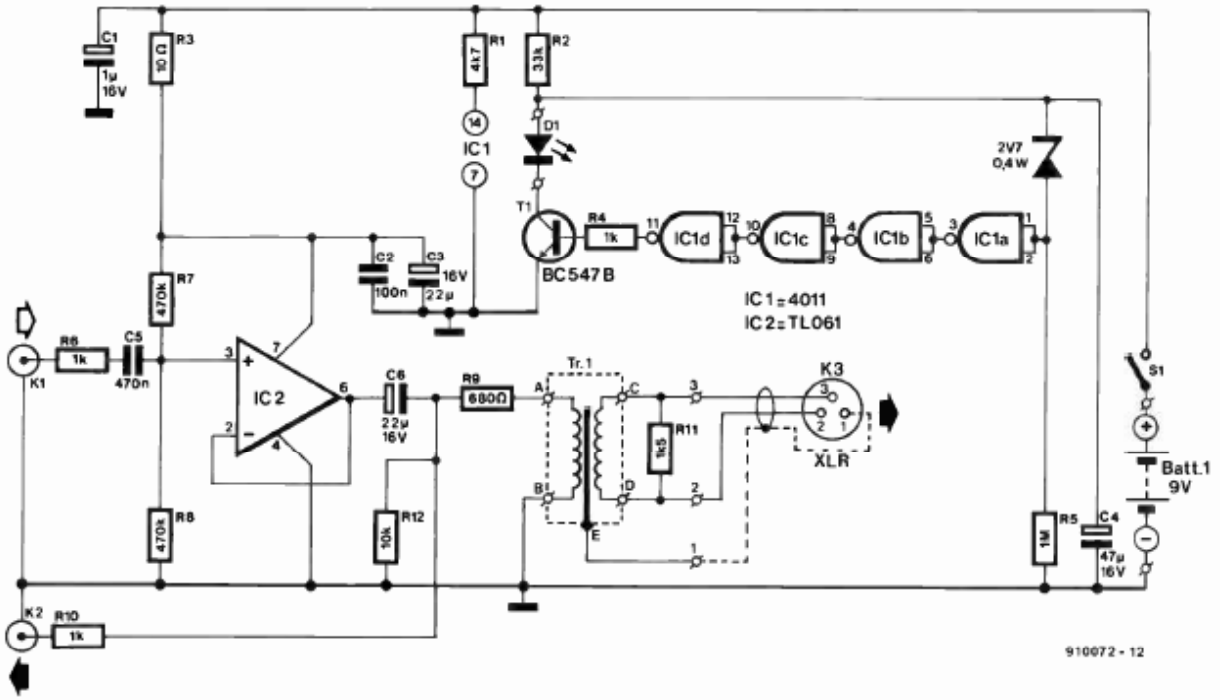

as an impedance converter. The TL 061 was designed specially for use in battery operated circuits. Its input impedance is determined by R_7 and R_8.

The output of IC_2 is taken via C6 to K2, which is the non-isolated output that may be used, as in Fig. 3, as the input to an amplifier.

The output of IC2 is also taken via R_9 to the heart of the converter: transformer Tr1, which must

- operate from a 600 Ω source;
- have a transformation ratio of 1:1;
- have a linear frequency response over the range 20 Hz to 20 kHz;
- be able to handle signal levels of 600 mV+.

These characteristics are met by a number of available commercial types; final choice depends on the operational requirements. The size of the transformer core determines the undistorted signal level at low frequencies: the larger the core, the better the performance, but, unfortunately, also the higher the price and the size of the converter.

Low-frequency distortion may be reduced by increasing the value of R_9, but this will be to the detriment of the signal level.

Normally, the LED is connected to the supply line via a series resistor. It then draws a current of about 10–20 mA, which is too much for battery operation. The gate-chain, contained in IC_1, reduces this to about 1% of these values. When S_1 is closed, C_4 is charged slowly via R_2 until D_2 conducts. There is then a high at the input of the gate-chain, which is repeated through the four gates, whereupon it switches on transistor T1, resulting in the LED lighting. Since the value of R_2 is too high for the LED current, the diode draws its energy from C_4.

After a while, the voltage across C_4 becomes too low to energize the LED, whereupon zener diode D_2 switches off and the logic levels at the gates are reversed. The circuit is once again in the output state, until C4 has been charged anew. The LED will flash in a rhythm determined by time constant R_2-C_4.

Resistor R_1 also serves to conserve energy by reducing the current drawn by IC_1 and changing the switching threshold from low to high. These measures ensure that a 9 V battery(PP3) gives roughly 400 hours operation. The average current drain at full drive is about 1 mA. The battery should be replaced when its voltage under load drops

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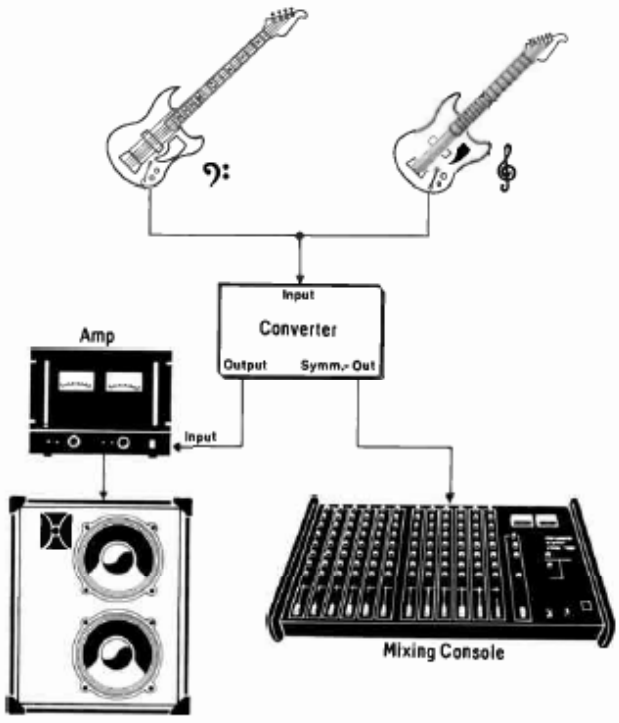

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below 6 V.

Construction of the converter is straightforward if the printed-circuit board shown in Fig. 4 is used. As mentioned earlier, make sure that the converter is fully isolated when it is used in a common enclosure. ■

PARTS LIST

Resistors:
R1 = 47 kΩ
R2 = 33 kΩ
R3 = 10 Ω
R4, R6, R10 = 1 kΩ
R5 = 1 MΩ
R7, R8 = 470 kΩ
R9 = 680 Ω
R11 = 1.5 kΩ
R12 = 10 kΩ

Capacitors:
C1 = 1 µF, 16 V, radial
C2 = 100 nF
C3, C6 = 22 µF, 16 V, radial
C4 = 47 µF, 16 V, radial
C5 = 470 nF

Semiconductors:
D1 = LED for chassis mounting
D2 = zener, 2.7 V, 400 mW
T1 = BC547B
IC1 = 4011
IC2 = TL061

Miscellaneous:
S1 = SPST switch
K1, K2 = 6.3 mm audio socket for panel mounting, mono, insulated
K3 = XLR socket for panel mounting
Batt.1 = 9-V battery (UK: PP3)
Tr1 = 600 Ω transformer – see text
Enclosure to personal requirements
PCB 910072
Front panel foil 910072-F

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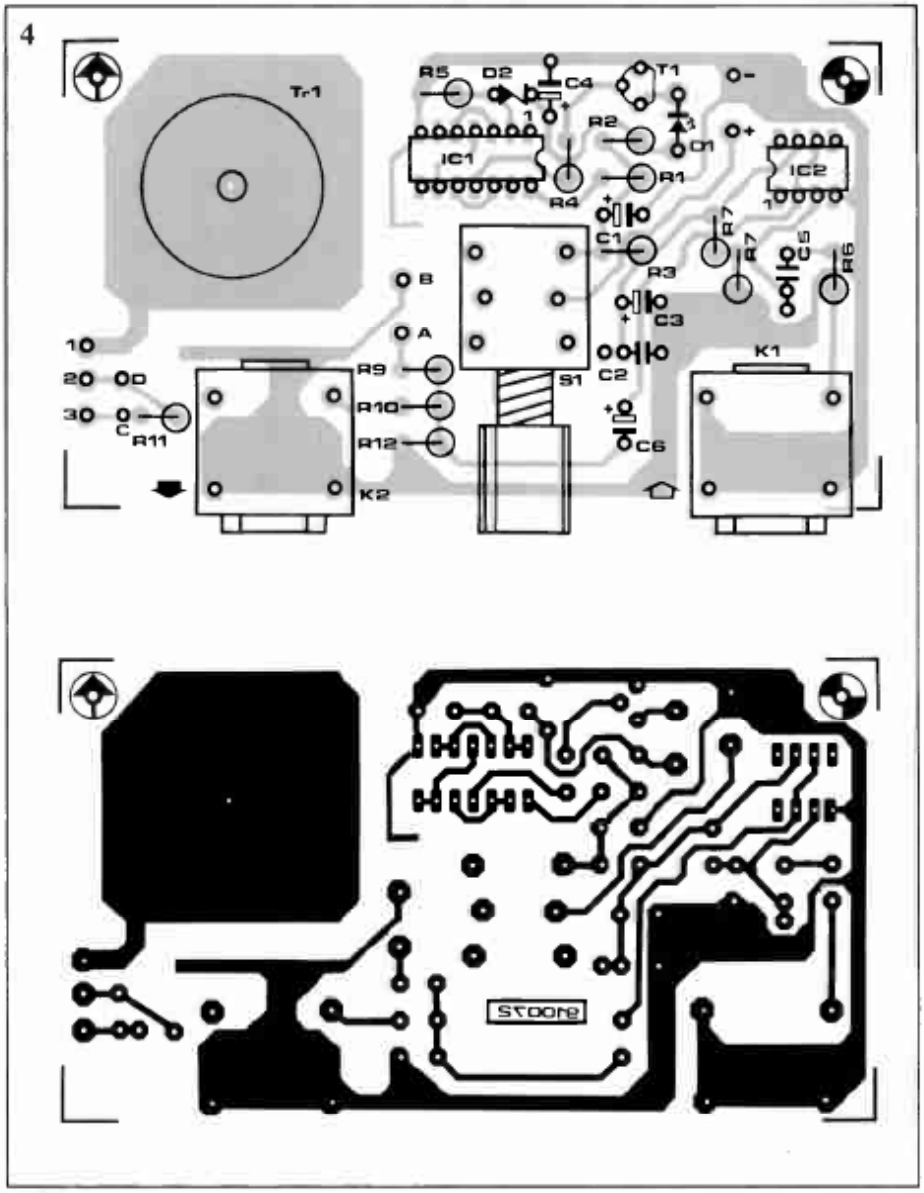

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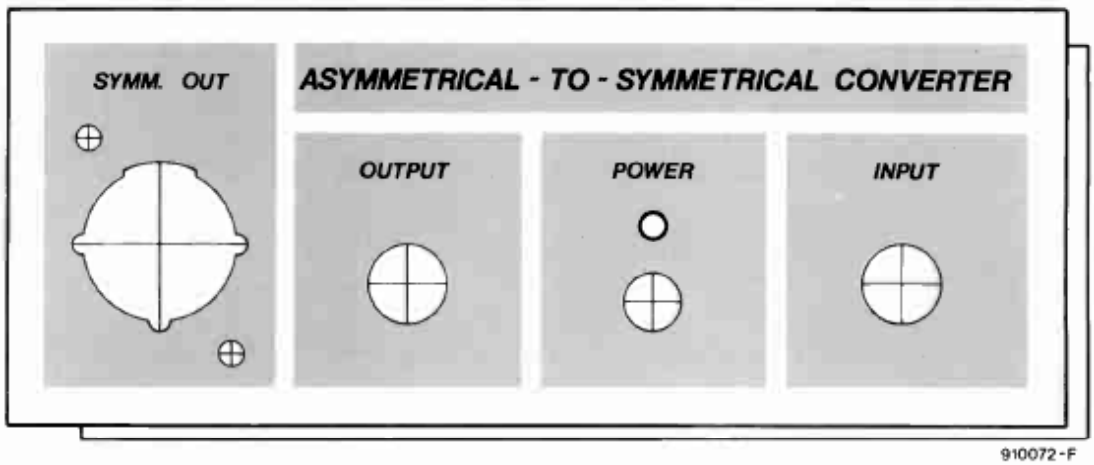

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